

REMARKS

This Amendment is filed in response to the Office Action dated August 11, 2004, which has a shortened statutory period set to expire November 11, 2004.

Applicant Addresses The Objections To The Specification As Well As To Claims 1 And 6

Applicant appreciates the Examiner's close reading of the Specification and the claims. Applicant has amended line 4 of paragraph [0004] to recite "locations" as recommended by the Examiner. Therefore, Applicant requests reconsideration and withdrawal of the objection to the Specification.

Applicant respectfully traverses the objections to Claim 1. Claim 1, as amended, now recites:

providing design geometry information regarding an area outside the AOI without use of inspection images of that area.

Applicant believes such amendment clarifies the term "inspection images". Therefore, Applicant requests reconsideration and withdrawal of the objection to Claim 1.

Applicant has amended Claim 6 to delete the term "wafer" as recommended by the Examiner. Therefore, Applicant requests reconsideration and withdrawal of the objection to Claim 6.

Claims 1-27 Are Patentable Over Pierrat And Liebmann

Applicant respectfully traverses the rejections of Claims 1-27 as being obvious over Pierrat in view of Liebmann. Claim 1 recites:

generating an inspection image of the AOI;
providing design geometry information
regarding an area outside the AOI without use of
inspection images of that area; and

performing a simulation of the AOI based on the inspection image and the design geometry information.

As taught by Applicant in paragraph [0032], design geometry information outside the area of interest (AOI) on a mask can be combined with inspection information from the AOI to facilitate generating an accurate, simulated wafer image. The design geometry information can be easily generated or accessed, thereby ensuring an uninterrupted inspection process and minimizing the associated storage costs for the simulation process. The design geometry information can be pseudo design geometry information or actual design geometry information. In contrast, neither Pierrat nor Liebmann disclose or suggest this improved simulation technique or appreciate its advantages.

Pierrat teaches providing an inspection device for capturing image data of a pattern in the mask, circuitry for using the captured image data to create an image of resist formed according to the pattern, circuitry for using the pattern data used to form the mask pattern to create a second image of resist formed, and circuitry for comparing the first image to the second image. Col. 3, line 64 to col. 4, line 4. Specifically, the image acquisition process generates a first simulated image. Col. 5, lines 28-29. Similarly, image data derived from the original pattern data can be processed through image simulation circuitry to create a second simulated image. Col. 5, lines 48-50. These first and second simulated images can be forwarded to and then compared by defect detection circuitry. Col. 6, lines 48-50.

Therefore, Pierrat fails to teach providing design geometry information regarding an area outside the AOI. Notably, for the defect detection circuitry to perform its comparison, the pattern data must logically refer to the AOI, not to the area

outside the AOI. Therefore, Pierrat would teach away from this limitation.

Moreover, Pierrat fails to teach performing a simulation of the AOI based on the inspection image and the design geometry information. Instead, Pierrat teaches performing two separate simulations: one simulation based on inspection data and another simulation based on design data. To obtain the inspection data, mask pattern 160.2 is exposed to energy source 110 and projected into image sensor 130. Col. 5, lines 8-9. The mask image is then acquired using inspection machine 100. Col. 5, lines 9-10. The resulting digital image of 160.2 is sent to image simulation circuitry, where it is used to construct image simulation 180. Col. 5, lines 45-48. Pierrat teaches nothing regarding supplementing this inspection data with design data to improve simulation accuracy.

However, the Office Action states that by combining the teachings of Liebmann and Pierrat, the following subject matter is disclosed utilizing Fig. 1 of Pierrat:

Simulation of a critical feature in the AOI is performed based on the inspection image of the AOI and the phase regions of a phase shifting mask deployed around the AOI according to design geometry information (photomask) in Step 180 - {Fig. 1}.

Applicant submits that this statement is nothing short of hindsight. Neither reference discloses or suggests this inclusion.

Specifically, Liebmann teaches a process for converting a chip design to a phase-shifted mask layout. Col. 3, lines 41-43. In this process, Liebmann locates features in a design of a phase-shifted mask that require phase shifting, creates uncolored phase regions on opposite sides of the features by expanding the feature edges, provides phase termination of the

phase regions based upon space constraints of the PSM technique utilized, determines phases of the phase regions, determines whether coloring errors and un-phase-shiftable design features exist, applies mask process specific overlaps and expansions to prepare designed data levels for mask manufacture, and derives a residual phase edge image removal design. Col. 12, lines 39-54. Thus, Liebmann teaches how to create a phase shifting mask. Therefore, Liebmann teaches nothing regarding simulation, much less improving simulation results based on a physical mask.

Because Pierrat and Liebmann, even when combined, fail to disclose or suggest performing a simulation of the AOI based on the inspection image and the design geometry information (wherein the design geometry information is regarding an area outside the AOI, provided without use of inspection images of that area), Applicant requests reconsideration and withdrawal of the rejection of Claim 1.

Claim 11, as amended, recites:

 Data for a simulation engine, the data comprising:

 first information from an inspection tool, the first information relating to a first area; and

 second information from a design file, the second information relating to a second area outside the first area,

 wherein the first information and the second information provide enhanced simulation accuracy for the first area.

Claim 18 recites:

 A system for simulating a defect on a mask, the system comprising:

 means for identifying an area of interest (AOI) including the defect;

 means for providing an inspection image of the AOI;

 means for providing design geometry information regarding an area surrounding the AOI; and

means for performing a simulation of the AOI based on the inspection image and the design geometry information.

Claim 25 recites:

A simulated image of an area of interest on a wafer, the simulated image comprising:

a feature, wherein the feature has an accuracy based on a mask inspection image having a defined area and design geometry information outside the defined area.

Claim 26 recites:

A method of improving simulation accuracy for an area of interest on a mask, the method comprising:

generating a mask inspection image having a defined area, wherein simulating the mask inspection image provides a first accuracy; and

combining the mask inspection image with design geometry information outside the defined area to create a composite image, wherein simulating the composite image provides an improved accuracy compared to the first accuracy.

Claim 27 recites:

A computer program product for simulating an area of interest (AOI) on a mask, the computer program product comprising:

a first set of instructions for receiving inspection information regarding the AOI;

a second set of instructions for receiving design geometry information regarding an area outside the AOI; and

a third set of instructions for performing a simulation of the AOI based on the inspection information and the design geometry information.

Therefore, Applicant submits that Claims 11, 18, 25, 26, and 27 are patentable for substantially the same reasons presented for Claim 1. Based on those reasons, Applicant requests reconsideration and withdrawal of Claims 11, 18, 25, 26, and 27.

Claims 2-10 depend from Claim 1 and therefore are patentable for at least the reasons provided for Claim 1. Based on those reasons, Applicant requests reconsideration and withdrawal of the rejection of Claims 2-10.

Claims 12-17 depend from Claim 11 and therefore are patentable for at least the reasons provided for Claim 11. Based on those reasons, Applicant requests reconsideration and withdrawal of the rejection of Claims 12-17.

Claims 19-24 depend from Claim 18 and therefore are patentable for at least the reasons provided for Claim 18. Based on those reasons, Applicant requests reconsideration and withdrawal of the rejection of Claims 19-24.

CONCLUSION

Claims 1-27 are pending in the present Application.
Allowance of these claims is respectfully requested.

If there are any questions, please telephone the
undersigned at 408-451-5907 to expedite prosecution of this
case.

Respectfully submitted,


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11/8/2004 Rebecca Baumann
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